8. RECONCEPTUALIZING SECONDARY SCIENCE TEACHER EDUCATION

Just as teachers should be reflective practitioners, science teacher educators should reflect on both current research as well as the research they pursue. With this in mind we would like to describe how we first developed our interests in pedagogical content knowledge (PCK) and how this interest evolved into a line of research that culminated in the redesign of the teacher education program at Oregon State University (see Chapter XI this volume). It is our hope that this personal example will help clarify the implications of research on PCK for secondary science teacher education as well as provide insight into a particular line of research.

Both of us are successful former high school biology teachers who consciously chose to leave the classroom so that we could have more impact by preparing future science teachers. This story is a familiar one to many college level teacher educators. It seems that at some point in many teachers’ careers there is a need to expand one’s influence beyond the students with whom you have been fortunate enough to have contact. During the latter portion of the 1980s we both found ourselves at OSU team teaching a microteaching course. At that time, there was some discussion in the literature, and even more within the university department, about the contribution of microteaching to the preparation of preservice teachers. In particular, microteaching courses have been considered sterile and too contrived. After all, teaching to one’s peers is not the same as facing a roomful of secondary students. We wondered whether there was any relevance of microteaching to the education of preservice teachers other than what we had convinced are ourselves to be the case. So, we began by investigating a sample of 17 preservice science and mathematics teachers within the context of a ten-week microteaching course (Gess-Newsome & Lederman, 1990). All students were satisfying the requirements for their initial secondary level (6-12) teaching certificate. Eleven of these students were completing requirements for a certificate in one or more of the sciences with the remaining five completing requirements for a mathematics certificate. This microteaching course was situated at the end of the campus-based portion of the teacher education program, just prior to student teaching. All students enrolled were required to plan and present four 15-20 minute lessons. Each presented lesson followed a different model/method of teaching: lecture/recitation, general inductive model, general deductive model, and a laboratory activity. Each lesson was videotaped and immediately followed by a class discussion evaluating the strengths and weaknesses of the lesson. Students were required to view their videotape and self-critique their lessons. Formal written feedback was provided by one of the course instructors following the submission of the self-critique.

The primary purpose of this research was to investigate preservice science/math teachers’ attitudes toward teaching and instructional decision making. The data sources were student self-critiques and a questionnaire completed prior to the first lesson presentation and following each of the lessons, for a total of five questionnaires. The questionnaires were identical and consisted of the following five open-ended items:

1. What have you learned, thus far, that will be of significant help to your student teaching? (For the questionnaire preceding the course, students were asked what they expected to learn).
2. Are those items discussed in #1 what you expected to learn?
3. Have you learned any instructional techniques that you initially did not anticipate as being important teaching skills? Explain your answer.
4. What relationship, if any, exists between your ability to plan and the quality of your presentation?
5. Are there any comments that you would like to make concerning the value or content of this course?

Initial analysis of the questionnaires enabled one of the researchers to derive and operationally define 16 categories and/or trends of the preservice teachers’ instructional concerns, attitudes, etc. These 16 categories were validated by the second researcher’s independent qualitative analysis of the same data set. Self-critique comments were then compared with the derived categories in order to establish any discrepancies or congruence between these more open-ended data and that derived from the more structured questionnaires. Final data analysis allowed consolidation of the 16 categories into a final list of 12 areas of concern which were grouped under two major headings: Concerns for Self and Concerns for Students. Concerns for Self included: physical appearance and expression, speech, audio-visual mechanics, lesson plan access. Concerns for students included: reaction to and cognizance of students, student involvement, instructional sequencing, concrete and relevant instruction, use of questioning, audio-visual use, management, instructional planning.

Most of the aforementioned categories did not present a picture different than what had been identified in previous research on student teachers, beginning, and experienced teachers (Fuller, 1969). However, our findings did add microteaching students’ concerns toward teaching to the literature. Furthermore, our investigation did not involve the imposition of an a priori set of categories (Fuller, 1969) into which teacher concerns were to be classified.

There were several interesting findings that had not been previously described in the research. Instructional planning was clearly viewed as a two phase process including both the physical act of planning and the mental rehearsal of the plan prior to teaching. The most significant finding related to the apparent shift of focus among the subjects from concerns for self to concerns for students, similar to the findings of Fuller (1969). However, the more detailed analysis allowed by our qualitative investigation showed that although the preservice teachers spoke about students, the students were really viewed as adversaries that could compromise the